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Value Chain Analysis of Barely: A Case of Ambo District, West Showa Zone of Oromia National Regional State, Ethiopia

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Abstract

Though barley value chains analysis assists governmental institutions and non-government organizations (NGOs) to assess their activities and redesign their operations, there has been no adequate study in Ambo district. Thus, this study aimed to analyze barley market value chain and identify determinants of the quantity of barley supply. The data were gathered from 132 randomly selected households, 20 traders and 4 input suppliers. Both descriptive statistics and econometric model were used for data analysis. The study revealed that the highest value added in barley value chains were about Birr 15.5/quintal. Rural assemblers in barley value chain obtained the highest share of gross profit next to producers. The Tobit regression estimator also revealed that age of the household, education of the household head, quantity of barley produced, use of fertilizer, improved seed used, and extension contact were significantly influencing the quantity of barley market supply. There was also no barley processor actor or that uses barley as a raw material in the barley value chain. Therefore, there is a need to promote agro-processors to be involved in barley processing and marketing.

Keywords: Actors; Ambo district; barley; market supply; value chain;

Introduction

Cereals are the most important food crops and they provide the majority of calories and protein worldwide (CSA, 2014). They are stapled foods in the diets of most population. In the year 2011, 2352.9 million metric tons of cereals were produced globally from 658.5 million hectares of land with average productivity of 30.83 quintals per hectares the world cereal production in the year 2011, was increased by more than 5% from previous year production. In the same year, Africa's contribution to the world output was 6.35% (FAO, 2011).

Ethiopia is recognized as a center of diversity, as its barley has global significance because of improved traits, including disease resistance (Bonman *et al*., 2005). Unlike in industrialized countries where barley is mainly used for animal feed and malting, it is one of the staple food crops in Ethiopia. For example, for Ethiopian highlanders, who produce Barely with indigenous technologies, barely accounts 6 % of the per capita calorie energy intake. It is also important in terms of the lives and livelihood of small farmers. In the 2014 autumn season, about 4.5 million smallholder farmers allocated more than one million hectares of land (12% of total cereal area) to barley cultivation. Corresponding barley production was about 2 million tons, equivalent to 10% of the total cereal production in the country (CSA, 2014).

Recently, the importance of barely is rapidly growing in terms of production, the potential for poverty reduction, as well as for the country's coffers and the current balance of payment situation. Between 2004 and 2014, the number of smallholders growing barley increased from 3.5 million to 4.5 million and barely yields increased from 1.17 metric tons

per hectare to 1.87 metric tons per hectare. Furthermore, total production grew from one million tons in 2005 to about 1.9 million tons in 2014 barley is the fifth most important cereal crop after teff, wheat, corn, and sorghum. It is cultivated by smallholders in every region of Ethiopia, since it is able to grow at all elevations, but it performs best at the higher elevations in the northern and central regions of the country (CSA, 2005; CSA, 2014).

However, Ethiopia produces mostly food barley, with its share estimated to be 90% and remains significantly deficient in malt barley. As a result, while the country has generated a surplus of food barley and has consistently exported a small amount, the net import bill for malt barley jumped from US$240 thousand in 1997 to US$40 million in 2014. If this trend continues, Ethiopia's barley import bill could be as high as US$420 million by 2025 (Alemu *et al*., 2014).

A review of literature in the agro-industry value chain in Ethiopia indicates that the sector faces many challenges due to limited market outlets, limited efforts in market linkage activities and poor market information among actors (Dereje, 2007; Dendena *et al*., 2009). Correspondingly, Mamo (2009) argued that small scale, dispersed and unorganized producers are unlikely to exploit market opportunities as they cannot attain the necessary economies of scale and lack bargaining power in negotiating prices. Therefore, there is a unique opportunity to promote domestic value addition, agro-industry development, and nonfarm income generation all of which are important elements of a successful economic transformation (Haggblade, *et al*., 2009).

Eventhough barley is the major crop grown in Ambo district and has an important opportunity in the economy, the value chain of this crop is highly constrained by many factors. There is production, productivity, and marketing-related problems in the district, which needed the specific focus of researchers to conduct value chain analysis of barely. Therefore, this study was designed to analyze barley market value chain and identify determinates of the quantity of barley supply which in turn assists for developing improved market development strategies to benefit the smallholder farmers, traders, and other market participants.

Methodology

The study was conducted in Ambo District, West Shoa Zone, Oromia Regional State, the central part of Ethiopia in 2016. According to production overview data obtained from district office of agriculture and rural development, barley is the third major crop grown in the district and the total area coverage of barley on average for the last five years (2011 to 2015) was 6440 ha.

Sampling methods and sample size determination

To select representative barley producing households in Ambo district from ten barley producing highland Kebeles [1], three barley producing Kebeles were selected randomly. The sample size was determined by using Yamane (1967) cited in Yilma (2005) to determine the required sample size at 95% confidence level, degree of variability = 0.5 and level of precision = 8%. The sample size was then calculated using the formula:

$$n = \frac{\mathrm{N}}{1 + N(e)^2}$$

where N is the total number of the target population.

Using probability proportional to size technique, a total of 132 barley producers were selected from each selected sample Kebeles. Specifically, the selected Kebeles and the corresponding number of sampled households wereGolja (32), K/Gitira (54) and Ukokorke (46). In addition to farm households, wholesalers or suppliers, local collectors, primary cooperatives and supporting actors in

[1]The smallest unit in Ethiopian administration system

the study area were included in the study sample.

Data types, sources, and methods of collection

Primary and secondary data were used to conduct this study. Primary data were collected using cross-sectional survey. Since the nature of the study demands the involvement of numerous value chain actors engaged in the barley value chain at different stages along the supply chain, the data were collected from input suppliers, small scale barley producers, and primary cooperatives participating in input supply, local assemblers, retailers and wholesalers. The secondary data were collected from different sources such as government institutions available in the district. Besides, different published and unpublished reports, bulletins and websites were reviewed to generate pertinent secondary data on barley production and marketing. A discussion was made with the important and concerned experts and other officials to collect additional information and/or cross-check the data.

Methods of data analysis

Descriptive statistics (mean, standard deviation, maximum, minimum, variance analysis, percentages and frequency of occurrence) and Tobit estimator was used to analyze the data with Stata version 13.

Marketing margin was calculated by using the following formula value chain studies by Mendoza (1995).

$$\text{TM M} = \frac{Retailing\ price - Farm\ gate\ price}{Retailing\ (Consumer)\ price} \quad (1)$$

$$\text{MM ra} = \frac{Rural\ assembler\ price - Farm\ gate\ price}{Retailing\ (Cosumer)\ price} \quad (2)$$

$$\text{MMW} = \frac{Wholesale\ Price - Rural\ assembler\ price}{Retailig\ (Cosumer)\ price} * 100 \quad (3)$$

$$\text{MM r} = \frac{Retailing\ price - Wholesale\ price}{Retailing(Cosumer)price} * 100 \quad (4)$$

$$\text{MM p} = 100\% - \text{TMM} \quad (5)$$

$$\text{MM} = \text{TMM} - \text{TMC} \quad (6)$$

Where; TGMM – denotes Total Gross Marketing Margin; GMM (RA) - The percentage of the total gross marketing margin received by the rural assembler; $GMM(w)$–The percentage of the total gross marketing margin received by the wholesaler; $GMM(r)$ - The percentage of the total gross marketing margin received by the retailer; GMM (p) - The producer participation margin; TMC- The total marketing charges expressed as percentage of retail price; and NMM – The net marketing margin.

Model choice and specification

Since our dependent variable-the quantity of barely supplied to the market- is a continuous variable, Ordinary Least Squares (OLS) estimator could be applied. However, the paper applied finally applies Tobit estimator since the dependent variable is censored from below since market supply cannot assume negative value as discussed in Tobin (1958). Thus, estimate the model is specified as follow:

$$BRS_{ij} = \beta_1 + \beta_2 HH_{ij} + \beta_3 X_{ij} + \beta_4 Z_{ij} + R_{ij} + \varepsilon i$$

Where BRS_{ij}quantity of is Barely supplied to the market by household i in Kebele j in quintal censored at zero from below; HH_{ij} is household characteristics such as age, educational level and sex of the household head as well as household size corresponding to household i in kebele j. X_{ij} represents institutional factors, namely, access to market information, credit facilities and extension services by household i in Kebele j. Z_{ij} stands for technology utilization such as use of fertilizers and high yield varieties by household i in Kebele j. R_{ij} denotes other factors such as the quantity of Barely produced and total livestock owned by the household. εi is the error term of the model such that $\varepsilon i \sim N(0, \sigma^2)$ and the $\beta' s$ are the parameters to be estimated.

Results and Discussion

Value chain actors are categorized under two important actors; these are direct and indirect actors. According to KIT *et al*. (2006), the direct actors are those involved in commercial activities in the chain (input suppliers, producers, traders, retailers, consumers). The indirect actors are those that provide financial or non-financial support services, such as credit agencies, business service providers, government, NGOs, cooperatives, researchers and extension agents. In the study area, there are different actors involved along the barley value chain, upstream from input supply to downstream consumers, playing different roles. The major actors participating in the barley value chain of the study area are input suppliers; barley producers: local assembler's; wholesalers; retailers and supporting actors.

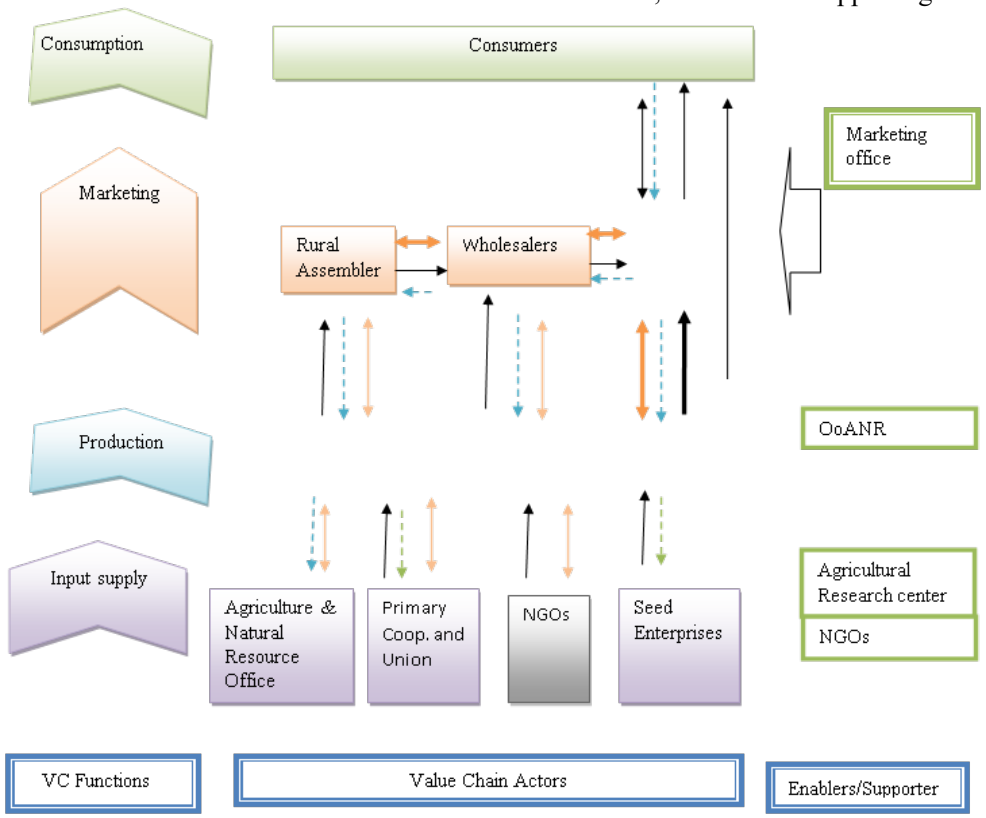

Figure 1. Barley value chain mapping of the study area

Key: Product flow ⟶ finance flow - - -▸ Market information flow ⟷

Note: OoANR stands for Agriculture and Natural Resource Organization

Governance of barley value chain

The dominant value chain actors play a facilitation role. They play a significant role in the flow of commodities and level of local market prices. In effect, they govern the value chain and most other chain actors subscribe to the rules set in the marketing process. The

study result indicated that wholesalers are the key value chain governors. The local market is heavily dependent on barley consumption price, and, therefore, the barley value chains are highly influenced by the consumption market price. In most cases, the business relations between the various operational actors are not free-market exchange but it is uncoordinated at all marketing stages. Due to the lack of a proper market information system and minimal bargaining power, farmers are forced to sell their product at the price offered by local assemblers. Wholesalers in Ambo district usually refer to Ethiopia Commodity Exchange (ECX) markets for price fixation.

As shown in Figure 1, there is no strong vertical linkage between value chain actors, but there is a horizontal linkage between wholesalers, cooperative unions and primary cooperatives and farmers with farmers. In some cases, the farmers have complaints on cooperatives and the cooperatives also have complaints on cooperative unions.

Market channel and performance analysis of barley value chain

Marketing channels analysis describes the direction and volume of goods and services flow from producers to consumers. Barley marketing channels were analyzed based on their direction and volume of flow. Four barley channels were identified that pass the commodity from producers to consumers. The major actors in the channels were producers, rural assemblers, urban wholesalers, urban retailers, and consumers. Through the channels, 395 quintals were passed from producers to consumers. There were four alternative buyers that purchased barley directly from sample households. From the marketed surplus, 42.25% was purchased by rural assemblers directly from producers, 19.25% by urban wholesalers, 17% by urban retailers and 21.5% by consumers (Figure 2). The rural assemblers sold to urban wholesalers.

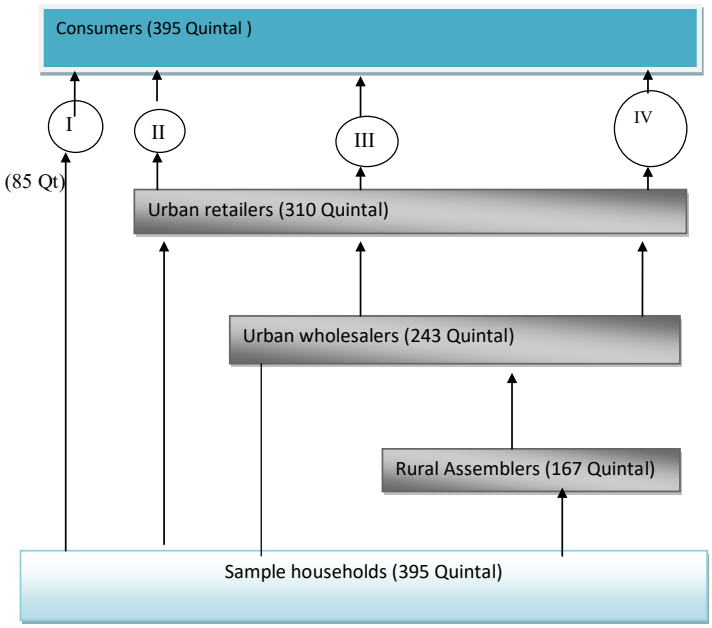

Figure 2. Barley market channels in the study area

In the barley channels, the largest volume flowed through channels and the smallest flow was through channel II. The market channels are described as follow:

Channel I Producers ⟶ Consumers

Channel II Producer → Retailers → Consumers
Channel III Producers → Wholesalers → Retailer → Consumers
Channel IV Producer → Local Assemblers → Wholesalers → Retailer → Consumers

Barley market performance

Value-added structure was analyzed using costs (production and marketing costs), marketing margins and returns. The analysis standardized unit of measurement into Birr per quintal. Actors incurred marketing costs for transportation, storage, sorting, packing, cleaning, loading/or unloading, commission, taxes, and others. Marketing margin used to measure the share of the final selling price that is captured by a particular actor in the value chain. Marketing margins were computed for producers, rural assemblers, wholesalers and retailers.

Table 1. Gross profit of actors in the barley value chain

Cost item(ETB)/qt	Producers	Rural assemblers	Urban wholesalers	Urban retailers	Horizontal sum
Purchasing price		600	715	795	
Production cost	306.93	-	-	-	
Marketing costs					
Transportation	-	6.83	8.00	2.00	16.83
Storage	6.75	0.90	1.50	-	9.15
Cleaning/packaging	-	1.67	1.50	-	3.17
Commission	-	1.08	0 .50	1.35	2.93
Custom fee/ tax	2.00	0.85	0.50	-	3.35
Loading/unloading	-	3.00	1.50	2.00	6.5
Personal expense	6.00	1.17	0.88	2.00	10.05
Total marketing costs	14.75	15.50	14.38	7.35	51.98
Total cost	321.68	615.53	729.38	802.35	2468.94
Selling price	600.00	715.00	795.00	860.00	
Market margin	293.07	115.00	80.00	65.00	487.82
% Share of margin	34.50	13.37	9.30	7.56	
Profit margin	278.32	99.47	65.62	57.65	501.06
% Share of profit	55.55	19.85	13.10	11.50	

Source: Authors' computation

Actors in the value chain add value through marketing costs such as transportation, loading/or unloading, cleaning, packaging, sorting, storage costs like, pest/or rodent control and weight loss. Production costs such as seeds, fertilizers, crop protection chemicals, land, labor and oxen were computed. As most households used their own family labor, oxen,

and land, opportunity costs were used to compute costs of production. Accordingly, the average cost of barley production per quintal for a sample household was 306.93Birr. The result showed that rural assemblers add more costs (15.50 Birr per quintal) than other actors. In the chain, producers had the highest share of market margin (34.50%) and profit margin (55.55%). From traders, rural assemblers had 13.37% and 19.85% share of market margin and profit margin, respectively (Table 1).

The value was added to the product when it passed from one actor to another. More value was added to transportation, storage loading or unloading and cleaning or packing. Actors in the value chain incurred 32.37% of marketing costs for transportation, 17.6% for storage costs, 12.5% for loading or unloading 6.1% for cleaning and packing, 5.64% for commission, 6.44% custom fee or tax and the rest 19.26% for personal expenses such as transport, food, mobile card and other utilities. Storage costs were incurred for storage rent, control storage pest and rodents, and weight loss during stocking. Weight loss during cleaning was also considered as a cost for traders.

It is also calculated as the percentage share received by each marketing intermediaries. There is a strong cumulative effect on the marketing margin resulting from the increasing number of intermediaries involved in the marketing process. Gross Marketing Margins (GMM) and Net Marketing Margins (NMM) were computed for the major actors in four marketing channels. The result showed that there was a difference in the consumers' price spread along the market channels. Total gross marketing margin was high in channel IV and low in channel II, about 38.05% of Total Gross Marketing Margin (TGMM) added to barley price in the channel when it reached the final consumers. Of this, rural assemblers received 24.31% and urban retailers 13.74%. In other words, the market channels with only one actor between producers and consumers showed low TGMM. For instance, in channel II only 18.15% of barley price was added when it reached final consumers. This implied that as the market margin becomes wide, price becomes high for consumers and low to producers (Table 2).

Table 2.Gross profit of actors along the barley market barley value chain

Marketing margin	I	II	III	IV
Total Gross Marketing Margin (TGMM %)	_	18.15	33.1	38.05
GMM of producers (GMMp)	100	81.85	66.9	61.95
GMM of rural assemblers (GMMa)	_	_	_	24.31
GMM of urban wholesalers (GMMw)	_	_	18.26	_
GMM urban retailers (GMMr)	_	18.15	14.84	13.74
Total Net Marketing Margin (TNMM %)	_	3.74	3.54	24.32
NMM of rural assemblers (NMMa)	_	_	_	14.08
NMM of urban wholesalers (NMMw)	_	_	0.95	_
NMM urban retailers (NMMr)	_	3.74	2.59	10.24

Source: Authors' computation

As can be seen from Table 3, the age of the farm household head entered the model with positive and statistically significant coefficient. This indicated that older and more experienced household heads tend to have more personal contacts, allowing discovery of trading opportunities at lowest cost supporting the findings of the current study. Consistence to

this study, studies by Christopher *et al*. (2014) and Randela *et al*. (2008) found that farmer's age had a positive and significant impact on the decision to participate in the potato market. However, the study on vegetable market supply by Berhanu *et al*. (2011) found that age of the household head had negative effect on the elasticity of onion supply to the market.

Table 3. Determinants of quantity barley market supply.

	Tobit estimator results
Age of household head	0.031**
	(0.018)
Sex of household head (Yes=1)	0.722
	(0.899)
Years of schooling of household head	0.579**
	(0.292)
Family size	0.127
	(0.144)
Quantity of Barely produced (in kg)	0.533***
	(0.044)
Livestock ownership (TLU)	0.009
	(0.019)
Used of Improved seed (Yes=1)	0.965***
	(0.479)
Use of pesticides (Yes=1)	2.872***
	(1.329)
Access to credit (Yes=1)	0.624
	(1.160)
Access to extension services (Yes=1)	1.959***
	(0.472)
Access to market information (Yes=1)	0.580
	(0.823)
Constant	-11.441***
	(2.371)

N= 132; Number of: 32 left-censored observations at; 98 uncensored observations; 0 right-censored; observations. Also, note that the numbers in parentheses indicate standard errors; and *** and ** shows that the variables are respectively statistically significant at 5% and 10% respectively.

The coefficient corresponding to the quantity of barely produced was positive and statistically significant. This shows that a quintal increase in Barely production was associated with 0.54 quintals increase in Barely supplied to the market. This finding is in agreement with previous studies conducted by Rehima (2006); Kindie (2007); Bosena (2008) which found that the amount of red pepper, sesame, and cotton respectively, produced by household positively affected marketable supply of each of the commodities.

Likewise, education level of the household head enters the model with positive coefficient implying that as the level of the farmers' education increases by 1 year, the quantity of Barely supplied to the market increases by 0.58 quintals keeping other determinants unchanged. This finding is consistent with results obtained by Moti *et al*. (2009) which find that household crop market participation was determined by literacy of the household head.

Equally, the use of fertilizer entered the model with a positive coefficient. Specifically, a kg

increase in fertilizer use was associated with 0.96 kg more barely supplied to the market. This result is intuitively appealing since technology utilization such as the use of fertilizer by the household is associated with an increase in production and hence helps the farmer supply more to the market keep other factors the same.

Interestingly, this study also found that access to extension service entered the model with the positive and statistically significant coefficient. This means that farmers that have access to extension services supply more Barely to the market than those who do not have access to such services ceteris paribus. This finding is in agreement with findings by Rehima (2006) and Rahmeto (2007) found that access to extension service on improved maize seed and red pepper respectively affected marketable supply of each of the commodities significantly and positively.

The current study also finds that the use of improved Barely seed has statistically positive and significant association with the quantity of barely supplied to market by the farm households. This is intuitively appealing and consistent with the finding of the by Abay (2007). This is so because improved seeds are associated with high productivity level and better capacity to resist diseases which in turn has higher probability to increase market supply.

Conclusion

The evaluation of barley markets performance was revealed high marketing margin, among marketing costs, actors incurred high costs on transportation. Producers obtained a higher percentage share of profit when they sold their product directly to consumers. Net marketing margin was highly associated with gross marketing margin. The higher the share of gross marketing margin, the more net marketing margin obtained. Quantity of barley market supply was also influenced by age and education level of the household head, the quantity of barley produced, utilization of improved technologies such as improved barely seed and chemical fertilizer and access to extension services. Furthermore, the study finds that there is no barley processor or any firm that uses barley as a raw material in the barley value chain in the district. Therefore, it needs to promote agro-processors to be involved in processing and marketing.

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